TISSUE AND GASTROINTESTINAL MICROBIOME RESPONSES TO ALTERNATE DIETARY LIPID IN SABLEFISH *Anoplopoma fimbria*

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Sablefish (*Anoplopoma fimbria*) is a cold water marine fish of the Eastern Pacific Ocean with good potential for marine aquaculture. While the nutritional requirements have yet to be fully elucidated, feeds containing high levels of marine proteins and oils are well utilized by the species. Because these feeds are viewed as unsustainable and as a potential barrier to the expansion of marine fish culture, we studied the transition of sablefish to plant-based feeds, formulated with either corn or flaxseed oil. Changes in tissue architecture and the gastrointestinal (GI) bacterial community, or GI microbiome, in response to these oil substitutions may underlie differences in nutrient value.

After 64 days, sablefish receiving the reference diet weighed more than cohorts receiving either corn oil- or flaxseed oil-substituted diet ($p < 0.0001$). A spectrum of histological changes were observed only in fish receiving substituted diets (Figure A). These included bile duct hyperplasia (Figure B) and hydropic vacuolation (hydropic vac.), hepatocellular nuclear pleomorphism/ megalocytosis (NP/MH), hepatocellular regeneration, hepatocellular hypertrophy, variable hepatocellular vacuolation (variable vac.), and exocrine pancreas vacuolation. In general, the prevalence and severity of these changes were higher among fish fed the flaxseed oil diet. Gastrointestinal changes in fish fed the substituted diets included reduction of mucous cells (upper and lower intestine) and decreased mucosal vacuolation (upper and lower intestine; pyloric caeca). A gastroenteritis characterized by eosinophilic granular cell infiltration into all segments of the GI tract occurred among all dietary groups.

Metagenomic DNA from the fish receiving different diets is being profiled against a 16S bacterial microarray (PhyloChip^{TM}) for dietary effects on the GI microbiome. Characterization of both host and response can provide an avenue to revealing mechanisms that underlie differential dietary effects, and may be a useful tool in nutrient formulation.

Figure A. Prevalence of tissue changes in liver and pancreas.

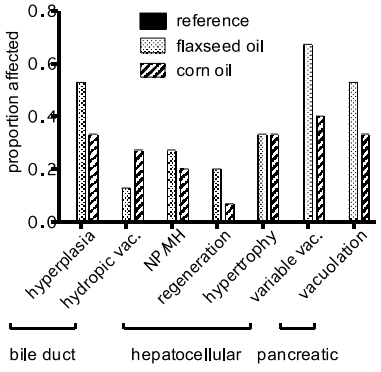

Figure B. Bile duct hyperplasia and typical hepatocytes (H & E stain).